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09/651,031	08/30/2000	Peter Hummel	G&C 30566.123-US-01	2037

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EXAMINER

CHANG, SUNRAY

ART UNIT	PAPER NUMBER
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2121

DATE MAILED: 01/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Applicati n No.

09/651,031

Applicant(s)

HUMMEL ET AL.

Examiner

Sunray Chang

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-- The MAILING DATE of this communication appears on the cover sheet with the c rrespondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 09 December 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 August 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☒ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

1. Claims 1 – 23 are presented for examination.

Claims 1 – 23 are rejected.

**Priority**

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

**Claim Rejections - 35 USC § 102**

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 – 6, 8, 9, 11 – 13 and 16 – 23 are rejected under 35 U.S.C. 102(b) as being anticipated by St. Ville (U.S. Patent No. 5,594,651, and referred to as Ville hereinafter).

4. Regarding independent claim 1, Ville teaches

- A method [new method, Fig. 3] for defining at least one parameter [forces & potentials, Fig. 3] for a finite elements analysis (FEA) calculation [Finite element analysis, Fig. 3] in a computer-assisted drafting (CAD) program [new method, Fig. 3].
- Determining a body [the object, Col 4, Line 44] for which parameter [manufacturing parameter, Col 4, Line 59] is to be defined [determined, Col 4, Line 61], body [the object,

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Col 8, Line 59] being an entity processed [geometrically model, Col 8, Line 58] by CAD program [computer-aided design, Col 8, Line 58]; and

- Using at least one graphical function [graphics software program, Col 13, Line 56] of CAD program [computer-aided design, Col 13, Line 55 and Col. 1, Line 49] to define a region [region A – F, Fig. 5A] within a face of body [Fig. 5A], region being used to define a load/support condition for FEA calculation [Identify forces applied to object intended application, Fig. 1, Sheet 1/11, Fig. 2].

Ville further teaches geometry includes dimensions [region], tolerances, surface finish, definitions of surfaces and edges [face], and, in some cases, the fit between two mating parts [body]. [Col. 1, Line 46 – 49]

5. Regarding independent claims 16 and 20, Ville teaches A computer program product [various functional modules, Col 14, Line 61] for execution by a general purpose computer [personal computer, Col 14, Line 63] for defining at least one parameter for a finite elements analysis (FEA) [finite element module, Col 15, Line 6] calculation in a computer-assisted drafting (CAD) program [computer aided design, Col 13, Line 55], computer program product including instructions [Three dimensional graphics software program, Col 13, Line 56] for determining a body [the object, Col 4, Line 47] for which parameter [manufacturing parameters, Col 4, Line 59] is to be defined [determined, Col 4, Line 61], body [the object, Col 8, Line 59] being an entity processed [geometrically model, Col 8, Line 58] by CAD program [computer aided design, Col 8, Line 58], and computer program product [various function module, Col 14,

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Line 61] further including instructions [Three dimensional graphics software program, Col 13, Line 56] for defining a region within a face of body [Define Initial Design Geometry, Fig. 1] using at least one graphical function [graphics software program, Col 13, Line 56] of CAD program [computer aided design, Col 13, Line 55], region [region, Col 12, Line 53] being used to define a load/support condition for FEA calculation [Identify forces applied to object intended, Fig. 1, Fig. 2].

6. Regarding dependent claim 2, Ville teaches selecting a type of load/support condition [force, stress-field, Col 1, Line 29, Fig. 2] to be defined [determination, Col 1, Line 29], selecting face of body [Fig. 6, Sheet 7/11], and defining further properties of load/support condition [The object maybe redesigned and/or new material may be selected, Col 1, Line 37, Fig. 2].

7. Regarding dependent claim 3, Ville teaches a load condition inside region, a load condition outside of region, a support condition inside region, and a support condition outside of region. [Each force which will be applied to the object during intended use, and the points and direction of application of the respective forces, are identified, Col 1, Line 48, Fig. 2] [Strains and stresses, Col. 2, Line 45]

8. Regarding dependent claims 4, 17 and 21, Ville teaches graphical function [graphics software program, Col 13, Line 56] of CAD program [computer-aided design, Col 13, Line 55] is a function selected from the following group of functions: a function of drawing [paint, Col 8, Line 66] an object [realistic picture, Col 8, Line 66], object being used to delimit region

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[dividing the geometric model of the object, Col 9, Line 60], and a function of selecting [variety of element shapes may be used, Col 9, Line 64] an object [realistic picture, Col 8, Line 66], object being used to delimit region.

9. Regarding dependent claim 5, Ville teaches object is drawn on face of body [Fig. 6, Sheet 7/11].

10. Regarding dependent claim 6, Ville teaches the view in which body [realistic picture, Col 8, Line 66] is displayed by CAD program [computer graphics output devices, Col 8, Line 67] is temporarily changed [modified, Col 9, Line 6] for facilitating drawing of object [initial geometric model, Col 9, Line 5].

11. Regarding dependent claim 7, Ville teaches calculating [discretizing, Col. 18, Line 43] a projection of object [geometric model, Col. 18, Line 43] onto face [finite element, Col. 18, Line 44] for determining [generating, Col. 18, Line 42] region [computerized mathematical model, Col. 18, Line 42].

12. Regarding dependent claim 8, Ville teaches graphical function [computer graphics output devices, Col 8, Line 67] of CAD program [computer aided design, Col 8, Line 58] is a function of subtracting [modified, Col 9, Line 6] a selected body [the object, Col 8, Line 59] from body [the object, Col 4, Line 47] determined in step (a).

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13. Regarding dependent claims 9, 18 and 22, Ville teaches step (b) is repeated to define a plurality of regions within at least one face of body [Fig. 6, Sheet 7/11], each region of plurality of regions being used to define at least one load/support condition for FEA calculation [Identify force applied to object in intended application, Fig. 1, Sheet 1/11, Fig. 2].
14. Regarding dependent claim 12, Ville teaches face of body is a curved face. [Fig. 6, Sheet 7/11]
15. Regarding dependent claim 13, Ville teaches region used to define load/support condition is a curved region. [Fig. 6, Sheet 7/11]

**Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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16. Claim 10, 11, 19 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ville and in view of Roth (U.S. Patent No. 5,289,567).

17. Regarding dependent claim 10, Ville teaches, defines a region [define initial design geometry, Fig. 1, Sheet 1/11] to define a load support condition for FEA calculation [Identify force applied to object in intended application, Fig. 1, Sheet 1/11, Fig. 2].

Ville does not teach steps of determining intersection points between the defined plurality of regions and determining overlapping portions of plurality of regions.

Roth teaches at least one of the steps of determining [checked, Col 8, Line 30] intersection points [intersection, Col 8, Line 31] between the defined pluralities of regions [bounding boxes, Col 8, Line 31] and determining [determine, Col 8, Line 38] overlapping portions [overlapping points, Col 8, Line 38] of plurality of regions [bounding boxes, Col 8, Line 31].

It would have been obvious to a person of ordinary skill in the art to modify the teaching of Roth to include “steps of determining intersection points between the defined plurality of regions and determining overlapping portions of plurality of regions.” with the motivation to provide for determining if there exist overlapping points or line segments in the model. And a logarithmic time per line rather than a linear query time is achieved.



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18. Regarding dependent claims 11, 19 and 23, Ville teaches the loads [loads, Col 4, Line 4] acting on [applied to, Col 4, Line 4] regions [the object, Col 4, Line 4] are defined as the sums [displacement resulting, Col 4, Line 6] of the individual loads acting on each region [application of the loads, Col 4, Line 7].

Ville does not teach overlapping portions of plurality of regions.

Roth teaches overlapping portions [overlapping points, Col 8, Line 38] of plurality of regions [bounding boxes, Col 8, Line 31].

It would have been obvious to a person of ordinary skill in the art to modify the teaching of Roth to include “overlapping portions of plurality of regions.” with the motivation to provide for determining if there exist overlapping points or line segments in the model. And a logarithmic time per line rather than a linear query time is achieved .

19. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ville and in view of Itoh et al. (U.S. Patent No. 5,774,124 and referred to as Itoh hereinafter).

20. Regarding dependent claim 14, Ville teaches (a) determining a body [the object, Col 4, Line 47] for which parameter [manufacturing parameter, Col 4, Line 59] is to be defined [determined, Col 4, Line 61], body [the object, Col 8, Line 59] being an entity processed [geometrically model, Col 8, Line 58] by CAD program [computer-aided design, Col 8, Line 58]; and (b) using at least one graphical function [graphics software program, Col 13, Line 56] of

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CAD program [computer-aided design, Col 13, Line 55] to define a region within a face of body [define initial design geometry, Fig. 1, Sheet 1/11], region being used to define a load/support condition for FEA calculation [Identify forces applied to object intended application, Fig. 1, Sheet 1/11].

Ville does not teach further step of determining contact points of region to an edge of face.

Itoh teaches further step of determining contact [aligned along, Col 2, Line 32] points of region [region boundary, Col 2, Line 32] to an edge of face [sides of the element, Col 2, Line 31].

It would have been obvious to a person of ordinary skill in the art to modify the teaching of Itoh to include “further step of determining contact points of region to an edge of face.” with the motivation to provide a method and system for automatically generating quadrilateral meshes for reducing the problem to one of a finite number of unknowns by dividing the solution region into elements and by expressing the unknown field variable in terms of assumed approximating functions within each element.

21. Regarding dependent claim 15, Ville teaches (a) determining a body [the object, Col 4, Line 47] for which parameter [manufacturing parameter, Col 4, Line 59] is to be defined [determined, Col 4, Line 61], body [the object, Col 8, Line 59] being an entity processed [geometrically model, Col 8, Line 58] by CAD program [computer-aided design, Col 8, Line

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58]; and (b) using at least one graphical function [graphics software program, Col 13, Line 56] of CAD program [computer-aided design, Col 13, Line 55] to define a region within a face of body [define initial design geometry, Fig. 1, Sheet 1/11], region being used to define a load/support condition for FEA calculation [Identify forces applied to object intended application, Fig. 1, Sheet 1/11].

Ville does not teach mesh elements are generated in a meshing step of said FEA calculation such that the borders of the mesh elements follow the borders of said region.

Itoh teaches mesh elements [mesh division, Col 1, Line 18] are generated in a meshing step [dividing, Col 1, Line 18] of FEA calculation [finite element analysis, Col 1, Line 20] such that the borders of the mesh elements [sides of elements, Col 2, Line 32] follow [aligned along, Col 2, Line 33] the borders of region [region boundary, Col 2, Line 33].

It would have been obvious to a person of ordinary skill in the art to modify the teaching of Itoh to include “mesh elements are generated in a meshing step of said FEA calculation such that the borders of the mesh elements follow the borders of said region.” with the motivation to provide a method and system for automatically generating quadrilateral meshes for reducing the problem to one of a finite number of unknowns by dividing the solution region into elements and by expressing the unknown field variable in terms of assumed approximating functions within each element.

**Response to Amendment**

**Claim Rejections - 35 USC § 102**

***Claim Rejections - 35 USC § 102***

22. Applicants' argument regarding "Ville teaches, (1) the load/support conditions are defined not during the CAD steps on the geographic model data, but during the FEA steps on the finite element model data, (2) no graphical CAD function is used for defining the load/support conditions, and (3) only forces acting on points (and not forces acting on regions within faces) can be defined" (Page 8, line 27 – 31) is respectfully disagreed with.

Regarding "the load/support conditions are defined not during the CAD steps on the geographic model data, but during the FEA steps on the finite element model data", Ville anticipates in the new method of Fig. 3, [(2) of 21, 22 and 3<sup>rd</sup> step of 23], the load/support conditions are defined not in Finite Element Analysis [24, Fig. 3] but pre-processing [22, Fig. 3, and Col. 8, Line 58 – 59], as set forth in current office action.

Regarding "no graphical CAD function is used for defining the load/support conditions", Ville anticipates graphical CAD function [22, Fig. 3, and Col. 8, Line 58 – 59] is used for defining the load/support conditions [Col. 13, Lines 55 – 59, Fig. 2, 3, and 8], as set forth in current office action.

Regarding "only forces acting on points (and not forces acting on regions within faces) can be defined", Ville anticipates "A computerized mathematical model of the object is generated by discretizing the geometric model of the object into a plurality of finite elements and defining nodes at boundaries of the elements, and specifying values at the nodes."[Abstract]. Valle discretizes model of the object into a plurality of finite elements then defining nodes at

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boundaries of elements, not only forces acting on points can be defined but forces acting on regions within faces can be defined.

**Conclusion**

23. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sunray Chang whose telephone number is (571) 272-3682. The examiner can normally be reached on M-F 7:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight can be reached on (571) 272-3687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-746-3506.

Sunray Chang  
Patent Examiner  
Group Art Unit 2121  
Technology Center 2100  
U.S. Patent and Trademark Office



**Anthony Knight**  
**Supervisory Patent Examiner**  
**Group 3600**

January 10, 2005